3B™

RESmart® CPAP and AutoCPAP System

Service Manual

BMC®

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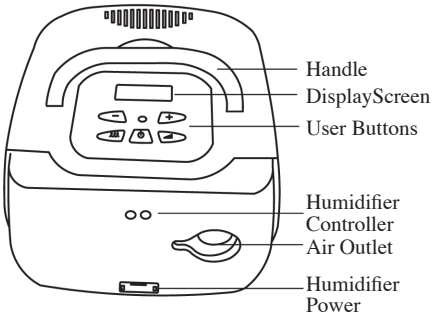
1. Introduction

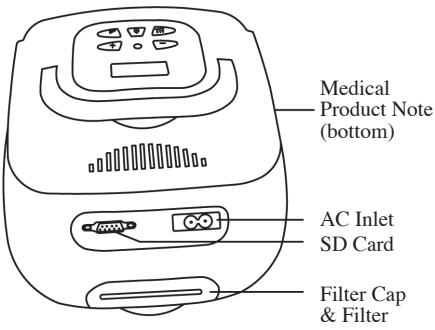
The RESmart® CPAP / Auto-CPAP units are continuous positive airway pressure devices designed for the treatment of adult obstructive sleep apnea (OSA) only.

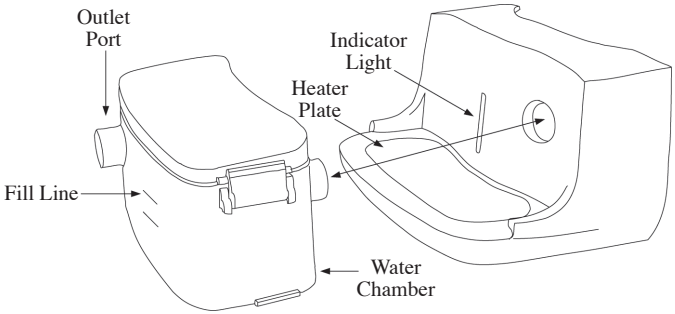
This service manual is intended only for manufacturer authorized service personnel. Maintenance actions performed by unauthorized service personnel will serve to void the manufacturer's warranty.

2. Structure

2.1 Outer Illumination







2.2 Inner Construction

See appendix A

2.3 Spare Part

See appendix B

3. Software

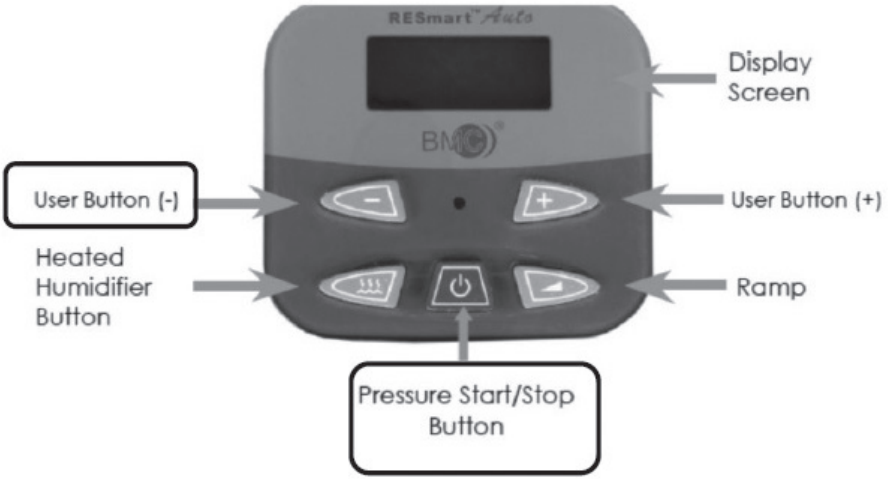
3.1 Instruction for Upgrading Device Software

1. Request copy of upgrade file prior to starting your upgrade, copy on to new SD card.

2. Power off RESmart® CPAP/AutoCPAP device, then insert new SD Card.

3. Press and hold both Pressure Start/Stop Button and User Button (-). Plug in power cord while keeping both buttons pressed.

4. System will begin upgrade.



3.2 Hidden Function

1. Clearing Patient Data
(Available on version 1.28 and later)

Clearing the data of the RESmart CPAP and Auto-CPAP unit requires use of a hidden function. Caution: Once the data is cleared, there is no possibility of recovering erased data.

To clear all recorded data and restore the unit to initial factory default settings, enter the Patient Menu by depressing ramp for 3 seconds or more. Advance the menu using the "+" sign until you reach the date option. Manually change the date to reflect: Year = 2097, Month = 07, Day =01, Hour = 0, Minute =26. Press On/Off button when "Hour" setting is displayed. It is not necessary to save the setting.

Important note: After data has been cleared, it will be necessary to re-set the device, reviewing all patient and clinician settings (i.e. enabling iCode, correcting to current date, etc.).

2. Pressure calibration

(Available on version 1.20 and later)

Connect pressure meter to the gas outlet in the device, enter hidden datesetting, set 'YYYY/MM/DD'='2098/08/08', press 'On/Off' when 'Hour' setting, thus pressure calibration starts. The device increases pressure to 20hPa(cmH2O), AD sampling data will appear on LCD. When LCD data displaying is stable, if pressure meter value is not 20, press '+/-' button to adjust the pressure output. Until output pressure value is 20 and LCD displays stable, press 'On/Off' button to finish pressure calibration.

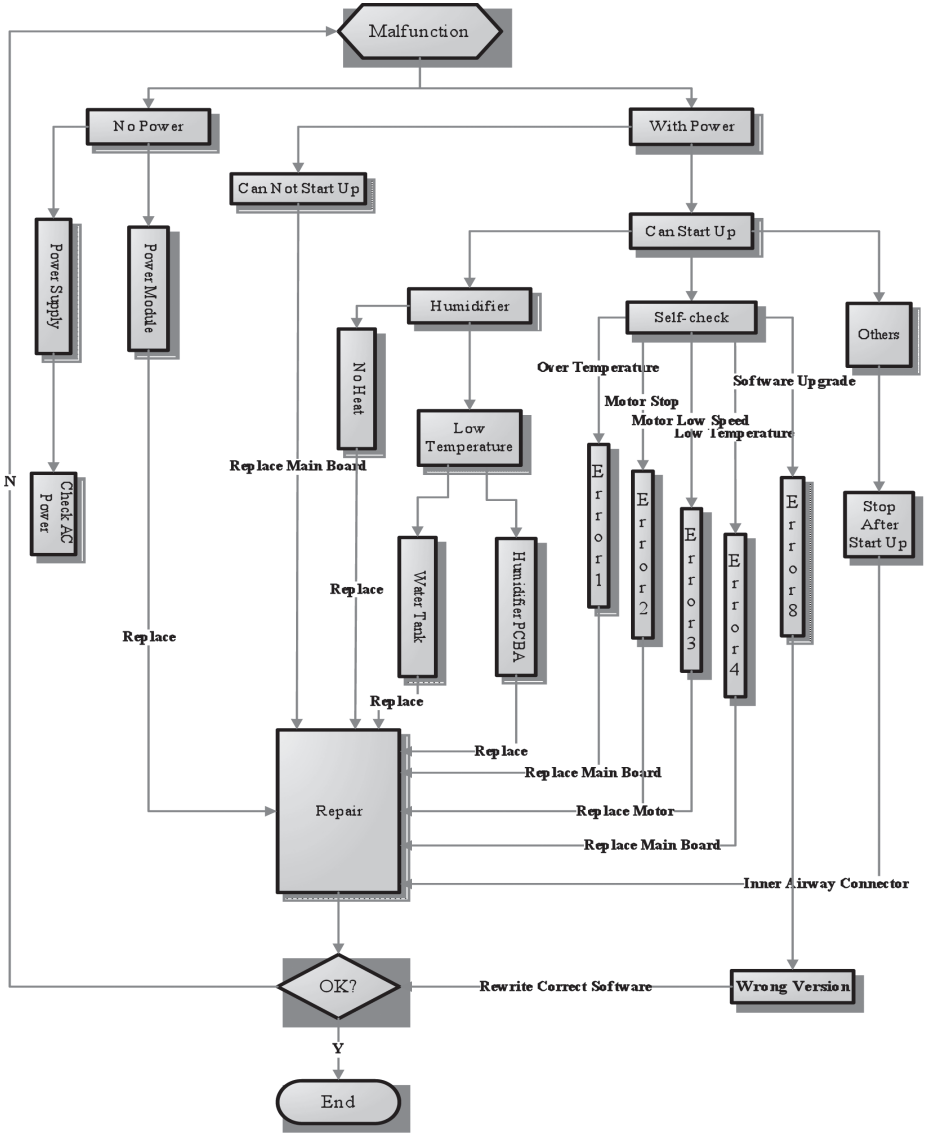
3. Debug mode

(Available on version 1.19 and later)

Enter hidden date setting, set 'YYYY/MM/DD'='2099/08/02(or 03)', press 'On/Off' when 'Hour' setting, thus debug #02 or #03 mode starts. The device can send real time data to computer via serial port. Only cutting off power supply can make device back to normal mode.

4. Malfunction and Countermeasure

4.1 Malfunction Determination



4.2 Error List and Information

Error Index	Problem	Causing
01	Overheat	Error reading from temperature sensor. Possible temperature sensor damage. Reset device if singular occurrence.
02	Blower feedback error	Check blower and pressure sensor.
03	Blower runs slowly	Blower, main board or pressure sensor problem.
04	Temperature sensor is damaged.	
07	Zero point drifting of pressure sensor ultra limit	Parameter error or pressure sensor damaged.
08	Version mismatch	The system was updated by a wrong version.
09	Device parameter error	Check device driver and circuit board
12	Sensor error	The device's temperature is too high or digital pressure sensor's problem.
13	Device temperature is lower than 0	Digital pressure sensor problem.
14	Blower overheats	The temperature of blower is too high or the blower temperature sensor is damaged.
15	Possible damage to temperature sensor	Restart device if singular occurrence.
16	Lack of hardware parameter	Unexpected error generated from sensor
17	BPAP software error	Write the software of 25T/30T into 25/25A.
18	BPAP software error	Write the software of 25/25A into 25T/30T.
19	Blower driver circuit overheats.	
20	The temperature sensor of blower driver circuit is damaged.	
21	Two sensors overheat at the same time (BPAP, Auto	The main board and flow sensor overheat at the same time. CPAP: The main board and the thermostat of power tube overheat at the same time.)
22	Blower current is over flow.	
23	The mean current of blower is over flow.	
24	During pressure calibration, the mean current is over flow.	
64	3.3V voltage supplied to digital flow sensor is abnormal.	
74	Blower data from serial port is wrong during calibration.	
75	Blower cannot run successfully in 20 seconds	

Appendices

Appendix A:

Device Configuration
1. Main device

Fig. A - Main board (backside)

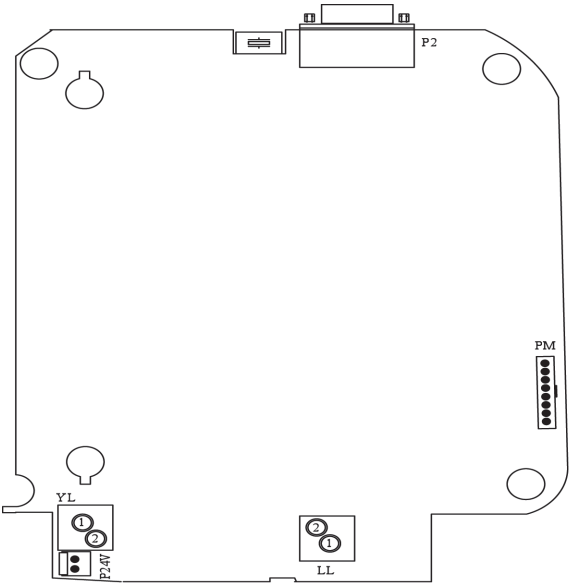
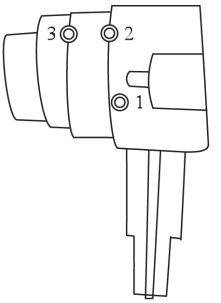


Fig. B – Outlet (leftside)



Hole #1, 2 and 3 in Fig. B, connect to sensor YL and LL via silicon rubber canal. Specified in Table 1:

Fig. B	Fig. A	Specification of canal
1	Hole #1 on sensor YL	2mm, 4mm, L12cm
2	Hole #2 on sensor LL	2mm, 4mm, L12cm
3	Hole #1 on sensor LL	2mm, 4mm, L8cm

Table 1

Fig. C – Power PCBA (front side)

Sockets figuration

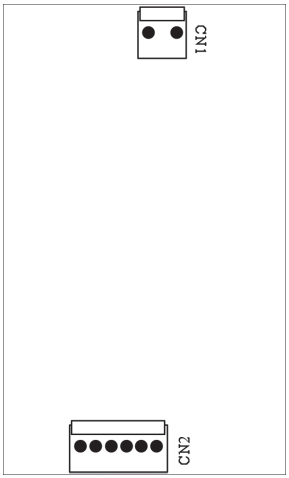


Fig. D – Wire connecting on power PCBA

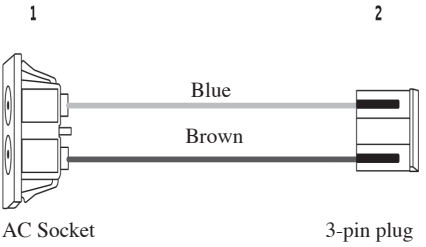


Fig. E – Power supply connecting

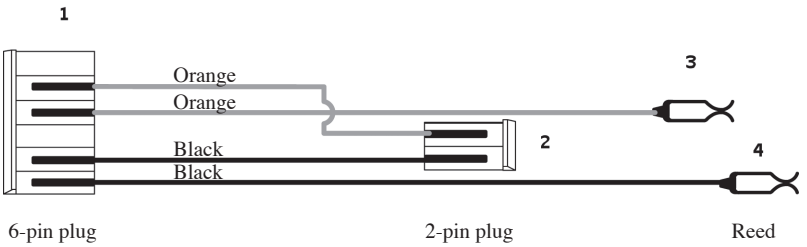
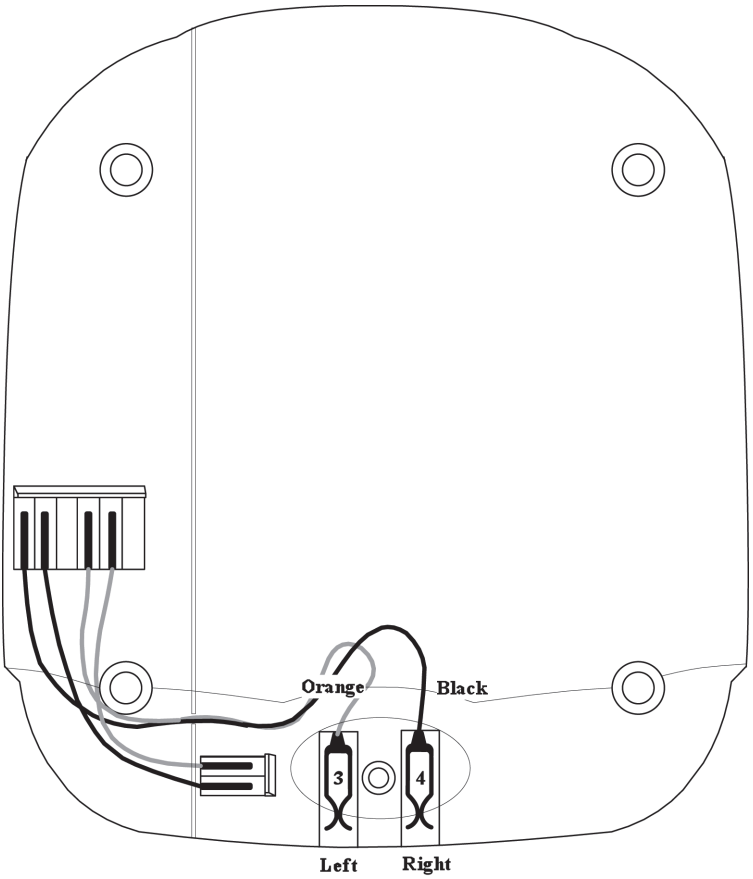


Fig. F – Power supply to humidifier



Connecting relationship:

Part / Fig.	1	2	3	4
D	Back of device	Fig. C: CN1		
E	Fig. C: CN2	Fig. A: P24	Fig. F: Left	Fig. F: Right
Blower 8-pin plug	Fig. A: PM			

Table 2

2. Humidifier

Fig. G – Humidifier PCBA (back side)

Fig. H – Power supply to humidifier

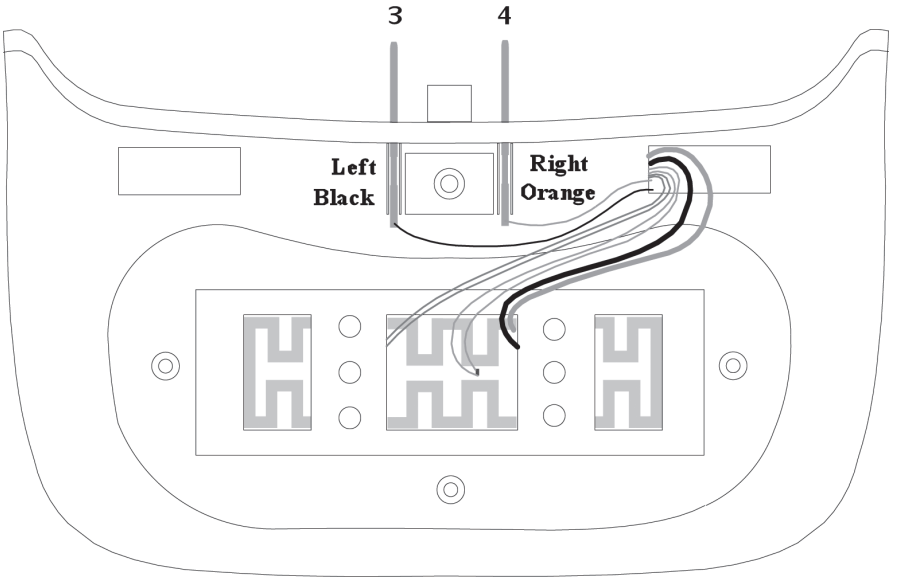
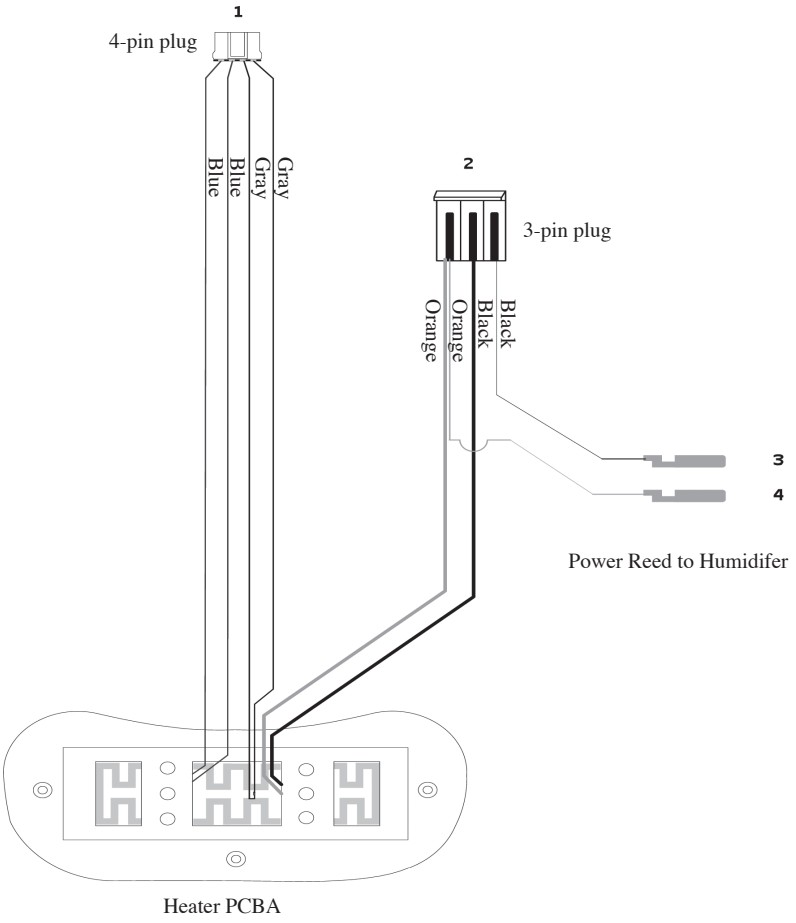


Fig. I – Heater PCBA



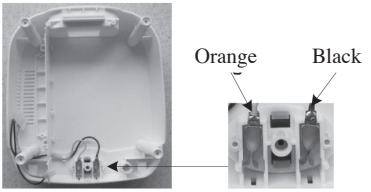
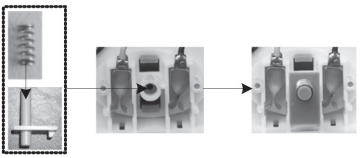
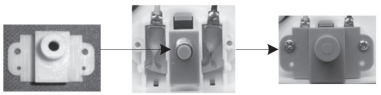
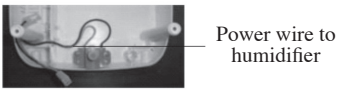
Connecting relationship:

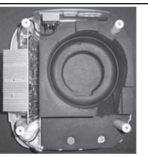
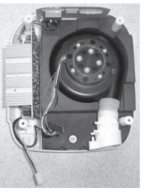
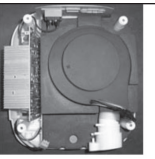
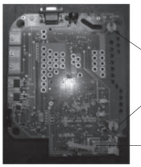
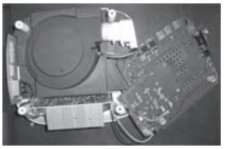
Part / Fig.	1	2	3	4
I	Fig. G: P2	Fig. G: P1	Fig. H: Left	Fig. H: Right

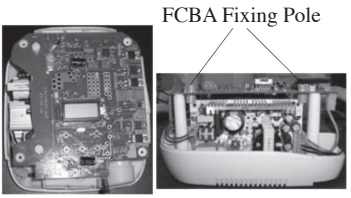
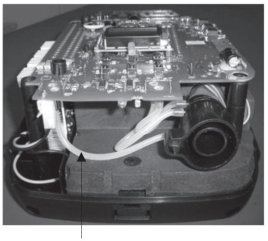
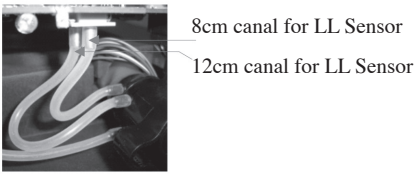
Table 3

Components Illumination

1. Device Inside

S/N	Assembly	Figure
1	Insert humidifier locker on the shield bottom.	
2	Insert humidifier power supply reed on the shield bottom as per Fig. E and F.	
3	Assembly the humidifier locker and button spring.	
4	Put fixing on the spring and fix by screw (2×3mm*8mm).	
5	Put power wire.	
6	Assembly the shield back on the bottom, fix by screw (2×3mm*8mm).	
7	Assembly foam (bottom) into shield bottom.	
8	Assembly AC power socket on the shield back (character face up).	

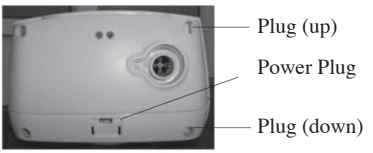
S/N	Assembly	Figure
9	Clean up the wire.	
10	Assembly power PCBA in the socket and connect all plugs. Clean up the wire.	
11	Connect outlet to blower connector, fix by clip.	
12	Connect blower to connector and fix by clip. Put the integrated one in the right place.	
13	Covered by foam cover and clean up wires.	
14	Assembly fixing clip on the main board PCBA.	
15	Plug the 8-pin plug of blower in the socket PM plug #2 as in Fig. E in the socket P24 on the main board PCBA.	

S/N	Assembly	Figure
16	Assembly the main board PCBA on fixing pole and make sure the clip clamps power PCBA.	
17	1. As per Table 1, connect sensor YL to outlet by silicon rubber canal. 2. Connect sensor LL to outlet by silicon rubber canal.	 

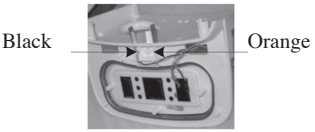
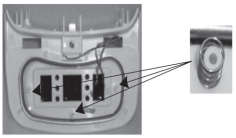
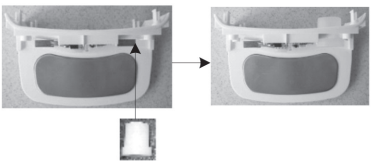
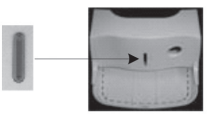
2. Device Outside

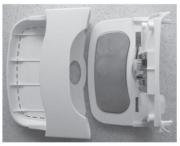
S/N	Assembly	Figure
18	Put handle in the socket on shield cover.	

S/N	Assembly	Figure
19	Assembly handle fixing to handle and fix by screw (4×3mm*8mm).	
20	Assembly the infrared window.	
21	Assembly and fix the panel.	
23	Put on the key button.	
24	Assembly shield cover on the bottom, adjust the position of outlet and make sure it is clamped in the right socket.	
25	Fix the shield by screws (4×M3*10mm).	
26	Stick four device pads.	
27	Put in filter and assembly the cover.	

S/N	Assembly	Figure
28	Put on all plugs if necessary (without humidifier).	

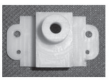
2. Humidifier

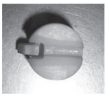
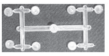
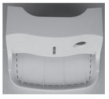
S/N	Assembly	Figure
1	As per Fig. H, assembly the heater plane and wire. Fix them by screw (3mm*8mm).	
2	Put spring on each of three poles on heater plane.	
3	Assembly the scaleboard on the heater plane and fix by screw (3mm*8mm).	
4	As per Table 3, assembly heater PCBA and wires.	
5	Put the humidifier inner connector on t he shield.	
6	Put on light window.	

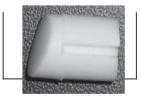
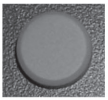
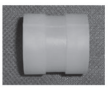
S/N	Assembly	Figure
7	Assembly the inner and outer shield.	
8	Fix on screw (M3*10mm).	Screw

Appendix B:

Spare Part Configuration

S/N	Name	Qty	Figure
1	Shield Cover	1	
2	Handle	1	
3	Handle Fixing	2	
4	Shield Bottom	1	
5	Humidifier Clip	1	
6	Humidifier Locker	1	
7	Humidifier Fixing	1	
8	Filter Cover	1	
9	Shield Back	1	

S/N	Name	Qty	Figure
10	Outlet	1	
11	PCBA Fixing	2	
12	Infrared Window	2	
13	Panel	1	
14	Humidifier Outer Shield	1	
15	Humidifier Inner Shield	1	
16	Light Window	1	
17	Pole Platelet	1	
18	Humidifier Power Plug	1	
19	Humidifier Plug (left-up)	1	
20	Humidifier Plug (left-down)	1	

S/N	Name	Qty	Figure
21	Humidifier Plug (right-up)	1	
22	Humidifier Plug (right-down)	1	
23	Device Pad	6	
24	Blower Connector	1	
25	Humidifier Inner Connector	1	
26	Key Button	1	
27	Humidifier Scaleboard	1	
28	Heater Plane Spring	3	
29	Button Spring	1	

Spare Part List

Part Name	S/N	Qty	Unit	Classify	Use
Main Board PCBA	20211261	1	PC	PCBA	Main Device
Heater PCBA	20212-41	1	PC	PCBA	Humidifier
Power Supply PCBA	20311101	1	PC	PCBA	Main Device
Blower	40211	1	PC	Assembly	Main Device
Heater Plane	45010101	1	Set	Assembly	Humidifier
Power Supply PCBA Wire	45010201	1	Set	Wire	Main Device
Main Board PCBA Wire	45010301	1	Set	Wire	Main Device
Silicon Rubber Canal	50224	1	PC	Assembly	Main Device
Silicon Rubber Canal	50224	1	PC	Assembly	Main Device
Foam (bottom)	40191-0101	1	PC	Foam	Main Device
Foam (cover)	40191-0201	1	PC	Foam	Main Device
Shield Cover	4011120101	1	PC	Plastic	Main Device
Handle	4011120201	1	PC	Plastic	Main Device
Handle Fixing	40111-0301	2	PC	Plastic	Main Device
Shield Bottom	4011120401	1	PC	Plastic	Main Device
Humidifier Clip	4011120501	1	PC	Plastic	Main Device
Humidifier Locker	40111-0601	1	PC	Plastic	Main Device
Humidifier Fixing	40111-0701	1	PC	Plastic	Main Device
Filter Cover	4011120801	1	PC	Plastic	Main Device
Shield Back	4011120901	1	PC	Plastic	Main Device
Outlet	4011123001	1	Set	Plastic	Main Device
PCBA Fixing	40111-1301	2	PC	Plastic	Main Device
Infrared Window	4011101401	2	PC	Plastic	Main Device
Panel	4011220101	1	PC	Plastic	Main Device
Power Supply PCBA Fixing	40111-1601	1	PC	Plastic	Main Device
Humidifier Outer Shield	4011122201	1	PC	Plastic	Humidifier
Humidifier Inner Shield	4011122301	1	PC	Plastic	Humidifier
Pole Platelet	40111-2601	1	PC	Plastic	Humidifier
Light Window	4011142401	1	PC	Plastic	Humidifier
Button Spring	4013140101	1	PC	Metal	Main Device
Humidifier Scaleboard	4013130401	1	PC	Metal	Humidifier
Heater Plane Spring	4013140501	3	PC	Metal	Humidifier
Humidifier Power Plug	4012110101	1	PC	Rubber	Main Device
Humidifier Plug (left-up)	4012110201	1	PC	Rubber	Main Device
Humidifier Plug (left-down)	4012110301	1	PC	Rubber	Main Device
Humidifier Plug (right-up)	4012110401	1	PC	Rubber	Main Device
Humidifier Plug (right-down)	4012110501	1	PC	Rubber	Main Device
Device Pad	4012110601	6	PC	Rubber	All
Key Button	4012110701	1	PC	Rubber	Main Device
Blower Connector	4012110801	1	PC	Rubber	Main Device

Spare Part List (cont.)

Part Name	S/N	Qty	Unit	Classify	Use
Humidifier Inner Connector	4012110901	1	PC	Rubber	Humidifier
Screw-1		8	PC	Screw	All
Screw-2		9	PC	Screw	All
Sunk Screw		4	PC	Screw	Main Device
Filter		1	PC	Accessory	All
Power Cord	33011101	1	PC	Accessory	All

Limited Warranty

3B Medical, Inc. (hereafter '3B') warrants that the RESmart® CPAP and Auto-CPAP devices will be free of all defects in workmanship and materials, and will perform according to specifications, for a period of two (2) years from the date of sale of the device, and 90 days on any accessories.

If the product fails to perform in accordance with the product specifications, 3B will repair or replace at its option, the defective material or part. This warranty does not cover damage caused by accident, misuse, abuse, alteration and other defects not related to material or workmanship.

- 3B will issue an RMA (Return Merchandise Authorization) within 24 hours of receipt of written notification of a failed or defective unit. Failed/defective units must be returned within 30 days of the RMA date.
- Shipping the machine to us for warranty diagnostic is the customer's responsibility. Warranty covers Domestic Shipping back to you. Please contact us for all warranty claims or questions.
- This warranty coverage is applicable to all 3B/BMC CPAP, Auto CPAP and Auto Bi-level devices.
- The warranty policy does not cover any damages caused as a result of alteration, intentional damage, modification, or unauthorized repair of the device.
- Warranty does include reasonable water damage and is at the sole discretion of 3B.
- This warranty replaces all other expressed or implied warranties, including any implied warranty of merchantability or fitness for a particular purpose. 3B reserves the right to amend this policy at any time.

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